CERTAIN OR IMPOSSIBLE

Suggested Grade

3

SD Mathematics Strand & Standard *(Primary for Task)*

Statistics & Probability

3.S.2.1. Students are able to describe events as certain or impossible.

Task Summary

Students will perform experiments and graph data to develop a sense of the probability of events that are certain to happen or impossible to happen.

Time and Context of Task

1 period – 30 to 45 minutes

Materials Needed

Dice, graph paper, dice squares, glue, handouts included with lesson

Author and Lead Teacher for the Task

Deb Ford
Chamberlain Elementary School

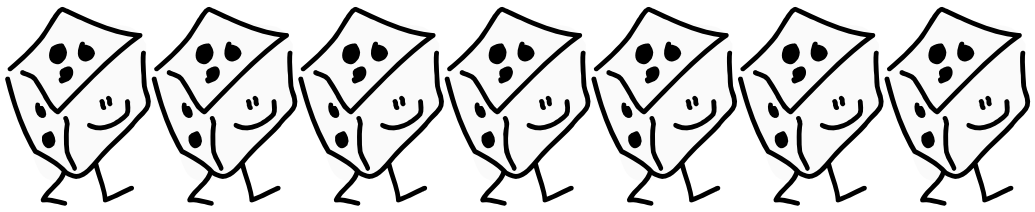
The lesson was taken from the book, Family Math, by Jean Kerr Stenmark, Virginia Thompson, and Ruth Cossey.

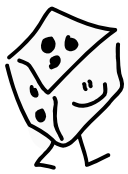
CERTAIN OR IMPOSSIBLE

With a partner, perform experiments that will help develop a sense of the probability of events that are certain to happen or impossible to happen, and to practice making data displays in the form of a bar graph.

Activity Procedure:

- Working with a partner, take one die. Look at each face carefully. If you were to roll the die 25 times, which number do you think would turn up most often? Write down your guess. What is the probability of rolling a zero or a seven? Write down your answer.
- Roll the die 25 times. Record each roll.
- Make a graph of the results. Using dice squares show each number you rolled. Cut out the squares and glue them onto the graph. Write three statements and three questions about the graph.
- Which number turned up most often? Were the others close?
- Roll the die 25 more times, and compare the results. Compare your results to your classmates. Are the results different?
- Did you ever roll a zero or a seven? What is the probability of rolling a zero or a seven? (impossible)
- What is the probability of rolling a one, two, three, four, five, or a six each roll? (certain)
- Put all the results onto one graph. Has the shape of the graph changed? What do you think would happen after a great many rolls?





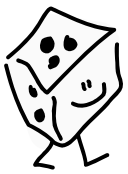
Names: _____

Certain or Impossible
Dice Activity

Working with a partner, take one die. Look at each face carefully. If you were to roll the die 25 times, which number do you think would turn up most often?

Write down your guess. _____

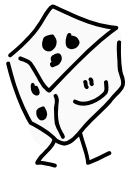
What is the probability of rolling a zero or a seven?



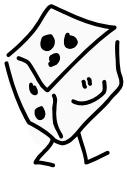
Write down your answer. _____

- Roll the die 25 times. Record each roll.
- Make a graph of the results. Put an X in the squares.
- Please answer the following questions after you complete your 25 rolls:

1. Which number turned up most often? _____
2. Were the others close? _____
3. Did you ever roll a zero or a seven? _____
4. What is the probability of rolling a zero or a seven? _____
5. What is the probability of rolling a one, two, three, four, five, or a six each roll? _____
6. What do you think would happen after a great many rolls? _____ _____
7. Name some events that are certain to happen: _____ _____ _____



8. Name some events that are impossible: _____ _____ _____



Probability Graph for Rolling Die

Number of Rolls								
10								
9								
8								
7								
6								
5								
4								
3								
2								
1								
0								
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Numbers on the Die

Write 3 statements about the graph:

1. _____
2. _____
3. _____

Write 3 questions about the graph:

1._____
2._____
3._____

CONTENT STANDARDS

Primary Standard

Strand Name: Statistics & Probability
SD Goal: Students will apply statistical methods to analyze data and explore probability for making decisions and predictions.
Indicator: Apply the concepts of probability to predict outcomes and solve problems.
Standard: 3.S.2.1. Students are able to describe events as certain or impossible.

Supplemental Standard

Strand Name: Statistics & Probability
SD Goal: Students will apply statistical methods to analyze data and explore probability for making decisions and predictions.
Indicator: Use statistical models to gather, analyze and display data to draw conclusions.
Standard: 3.S.1.2 Students are able to gather data and use it to complete a scaled and labeled graph.

NCTM Process Standard

Problem Solving

- Build new mathematical knowledge through problem solving
- Apply and adapt a variety of appropriate strategies to solve problems

Reasoning and Proof

- Develop and evaluate mathematical arguments and proofs

Communication

- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Use the language of mathematics to express mathematical ideas precisely

Representation

- Create and use representations to organize, record, and communicate mathematical ideas

Problem-Solving Strategies

- Estimation and check
- Modeling
- Drawing pictures, graphs and tables
- Looking for patterns
- Use of manipulatives

ASSESSMENT TOOLS

Chamberlain Elementary Schools

Math Rubric

Name: _____ Teacher: Mrs. Ford

Date Submitted: _____ Title of Work: _____

	Criteria				Points
	4	**3**	**2**	**1**	
Explanation	A complete response with a detailed explanation.	Good solid response with clear explanation.	Explanation is unclear.	Misses key points.	____
Use Of Visuals	Clear graph with some explanation	Clear graph	Inappropriate or unclear graph.	No graph	____
Mechanics	No math errors.	No major math errors or serious flaws in reasoning.	May be some serious math errors or flaws in reasoning.	Major math errors or serious flaws in reasoning.	____
Demonstrated Knowledge	Shows complete understanding of the questions, mathematical ideas, and processes.	Shows substantial understanding of the problem, ideas, and processes.	Response shows some understanding of the problem.	Response shows a complete lack of understanding for the problem.	____
Requirements	Goes beyond the requirements of the problem.	Meets the requirements of the problem.	Hardly meets the requirements of the problem.	Does not meet the requirements of the problem.	____
				Total---->	____

Teacher Comments:

Advanced	**Third grade students performing at the advanced level:** • create a graph from gathered data; • create a list of events that are certain or impossible.
Proficient	**Third grade students performing at the proficient level:** • answer questions from data represented in graphs; • describe events that are certain or impossible; • complete a given graph.
Basic	**Third grade students performing at the basic level:** • answer simple questions about a graph; • identify events that are impossible.

Third Grade Statistics & Probability
ELL Performance Descriptors

Proficient	**Third grade ELL students performing at the proficient level:** • read and answer questions about data represented in graphs; • identify events as impossible or certain using concrete materials or pictorial representations; • read, write, and speak the language of mathematics.
Intermediate	**Third grade ELL students performing at the intermediate level:** • answer directed questions related to data presented in graphs; • identify events as impossible using concrete materials or pictorial representations; • explain in mathematical terms the sequence of steps used in solving problems; • give simple oral or written responses to questions on topics presented in class.
Basic	**Third grade ELL students performing at the basic level:** • answer directed questions about basic graphs; • recognize and use basic statistics and probability terms; • respond to yes or no questions and to problems presented pictorially or numerically in class.
Emergent	**Third grade ELL students performing at the emergent level:** • answer directed questions about basic graphs; • give simple oral responses to questions on topics presented in class; • imitate pronunciation of statistics and probability terms; • use non-verbal communication to express mathematical ideas.
Pre-emergent	**Third grade ELL students performing at the pre-emergent level:** • observe and model appropriate cultural and learning behaviors from peers and adults; • listen to and observe comprehensible instruction and communicate understanding non-verbally.

CERTAIN OR IMPOSSIBLE
Student Work Samples

As you examine the samples, consider the following questions:

- In light of the standard/s addressed and the assessment tools provided, what evidence does the work provide that students are achieving proficiency in the knowledge and skills addressed by the standard/s for the task?
- Is the task/activity well designed to help students acquire knowledge and demonstrate proficiency? Is the task/activity clearly aligned with the standards? In what ways would you adapt the task/activity to better meet the needs of your students?

Student Work Sample #1

Names:_____

Certain or Impossible
Dice Activity

- Working with a partner, take one die. Look at each face carefully. If you were to roll the die 25 times, which number do you think would turn up most often?

  Write down your guess. 6

  What is the probability of rolling a zero or a seven?

  Write down your answer. 0

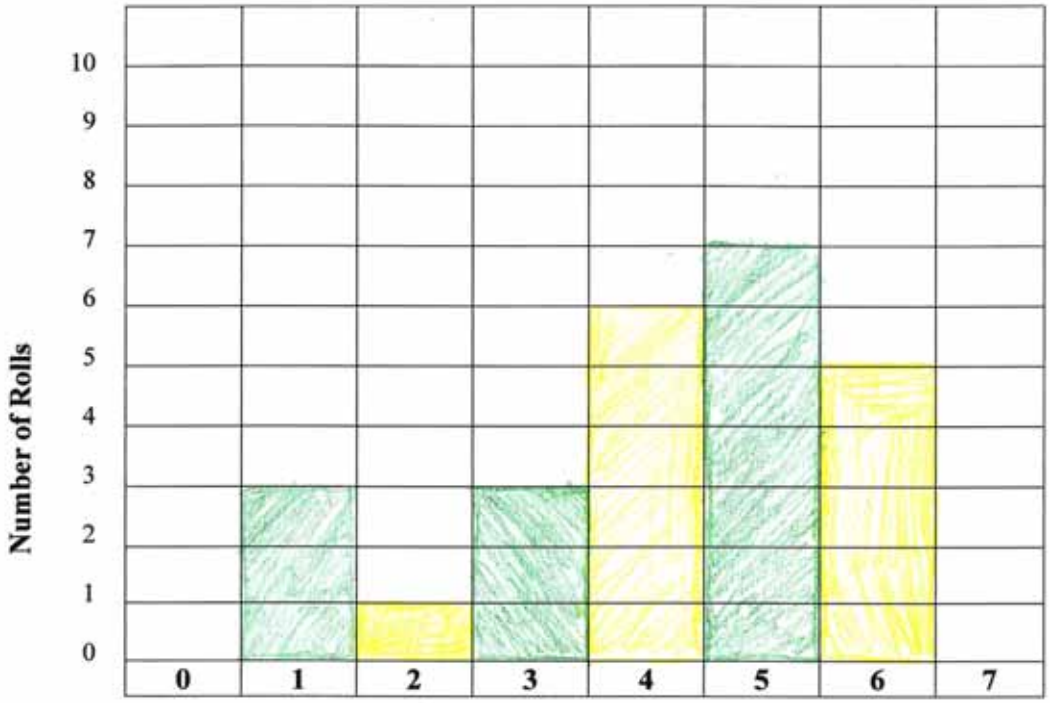
- Roll the die 25 times. Record each roll.
- Make a graph of the results. Put an X in the squares.
- Please answer the following questions after you complete your 25 rolls:

1. Which number turned up most often? 5
2. Were the others close? 4 and 6 were close to 5
3. Did you ever roll a zero or a seven? No
4. What is the probability of rolling a zero or a seven? impossible
5. What is the probability of rolling a one, two, three, four, five, or a six each roll? certain
6. What do you think would happen after a great many rolls? They might all tie. You would never get a 7 or 0.
7. Name some events that are certain to happen. we will get out of school at 3:25.
8. Name some events that are impossible. for me to know everything.

Sample #1 – Page 2

Roll die 25 times and record results.

Probability Graph For Rolling Die



Write 3 statements about the graph.

1. 5 has the most rolls.

2. 2 has the least amount of rolls.

3. 1 and 3 had the same amount of rolls.

Write 3 questions about the graph.

1. How many more rolls dose 4 have than 2?
2. How many rolls dose 7 have?
3. Witch number has the most rolls?

Looking at Student Work – Instructor notes and rating for work sample #1

Chamberlain Elementary Schools
Math Rubric

Name: _____ Teacher: Mrs. Ford

Date Submitted: 1-25-05 Title of Work: Certain or Impossible

	Criteria				Points
	4	3	2	1	
Explanation	A complete response with a detailed explanation.	Good solid response with clear explanation.	Explanation is unclear.	Misses key points.	4
Use Of Visuals	Clear graph with some explanation	Clear graph	Inappropriate or unclear graph.	No graph	4
Mechanics	No math errors.	No major math errors or serious flaws in reasoning.	May be some serious math errors or flaws in reasoning.	Major math errors or serious flaws in reasoning.	4
Demonstrated Knowledge	Shows complete understanding of the questions, mathematical ideas, and processes.	Shows substantial understanding of the problem, ideas, and processes.	Response shows some understanding of the problem.	Response shows a complete lack of understanding for the problem.	4
Requirements	Goes beyond the requirements of the problem.	Meets the requirements of the problem.	Hardly meets the requirements of the problem.	Does not meet the requirements of the problem.	3
				Total---->	17

Teacher Comments: Advanced- This work was give an advanced score because the student completed a graph and listed events that are certain or impossible. The student wrote statements and questions about the graph.

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Student Work Sample #2

Names:_____

Certain or Impossible
Dice Activity

- Working with a partner, take one die. Look at each face carefully. If you were to roll the die 25 times, which number do you think would turn up most often?

  Write down your guess. 5

  What is the probability of rolling a zero or a seven?

  Write down your answer. imposible

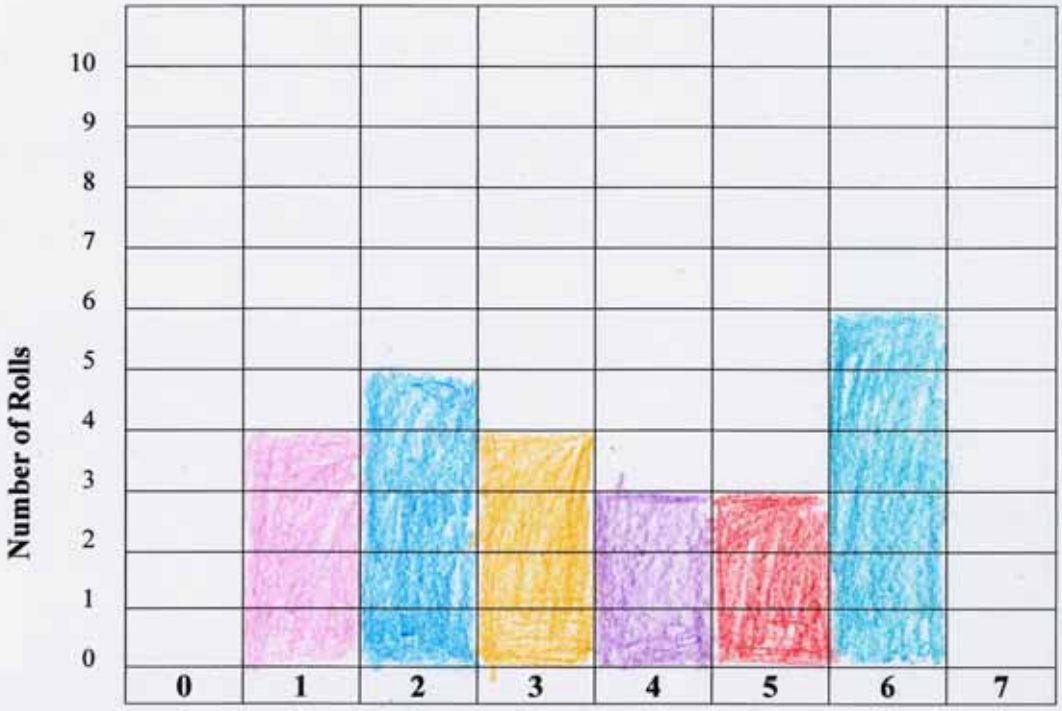
- Roll the die 25 times. Record each roll.
- Make a graph of the results. Put an X in the squares.
- Please answer the following questions after you complete your 25 rolls:

1. Which number turned up most often? 6
2. Were the others close? 1, 2, and 3 are close to it.
3. Did you ever roll a zero or a seven? NO
4. What is the probability of rolling a zero or a seven? imposible
5. What is the probability of rolling a one, two, three, four, five, or a six each roll? Certain
6. What do you think would happen after a great many rolls? I think we would roll more sixes beacause we rolled mor sixes in the first 25 rolls.
7. Name some events that are certain to happen. I am certain that if you unplug the TV it will not work.
8. Name some events that are impossible. It is impossible that the sky will fall today.

Sample #2 – Page 2

Roll die 25 times and record results.

Probability Graph For Rolling Die



Write 3 statements about the graph.

1. We had more sixes than anything.
2. Four and five are tied
3. Two came in second

Write 3 questions about the graph.

1. What number has the same amount as three?
2. Which numbers tied for last?
3. How many times did we roll six?

Looking at Student Work – Instructor notes and rating for work sample #2

Chamberlain Elementary Schools

Math Rubric

Name: _____ Teacher: Mrs. Ford

Date Submitted: 1-25-05 Title of Work: Certain or Impossible

	Criteria				Points
	4	3	2	1	
Explanation	A complete response with a detailed explanation.	Good solid response with clear explanation.	Explanation is unclear.	Misses key points.	3
Use Of Visuals	Clear graph with some explanation	Clear graph	Inappropriate or unclear graph.	No graph	4
Mechanics	No math errors.	No major math errors or serious flaws in reasoning.	May be some serious math errors or flaws in reasoning.	Major math errors or serious flaws in reasoning.	4
Demonstrated Knowledge	Shows complete understanding of the questions, mathematical ideas, and processes.	Shows substantial understanding of the problem, ideas, and processes.	Response shows some understanding of the problem.	Response shows a complete lack of understanding for the problem.	4
Requirements	Goes beyond the requirements of the problem.	Meets the requirements of the problem.	Hardly meets the requirements of the problem.	Does not meet the requirements of the problem.	3
				Total---->	18

Teacher Comments: Proficient - This work was given a proficient score because the student completed the graph and described certain or impossible events. The student wrote statements and questions about the graph.

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Student Work Sample #3

Names: _____

Certain or Impossible
Dice Activity

- Working with a partner, take one die. Look at each face carefully. If you were to roll the die 25 times, which number do you think would turn up most often?

  Write down your guess. 5

  What is the probability of rolling a zero or a seven?

  Write down your answer. impossible

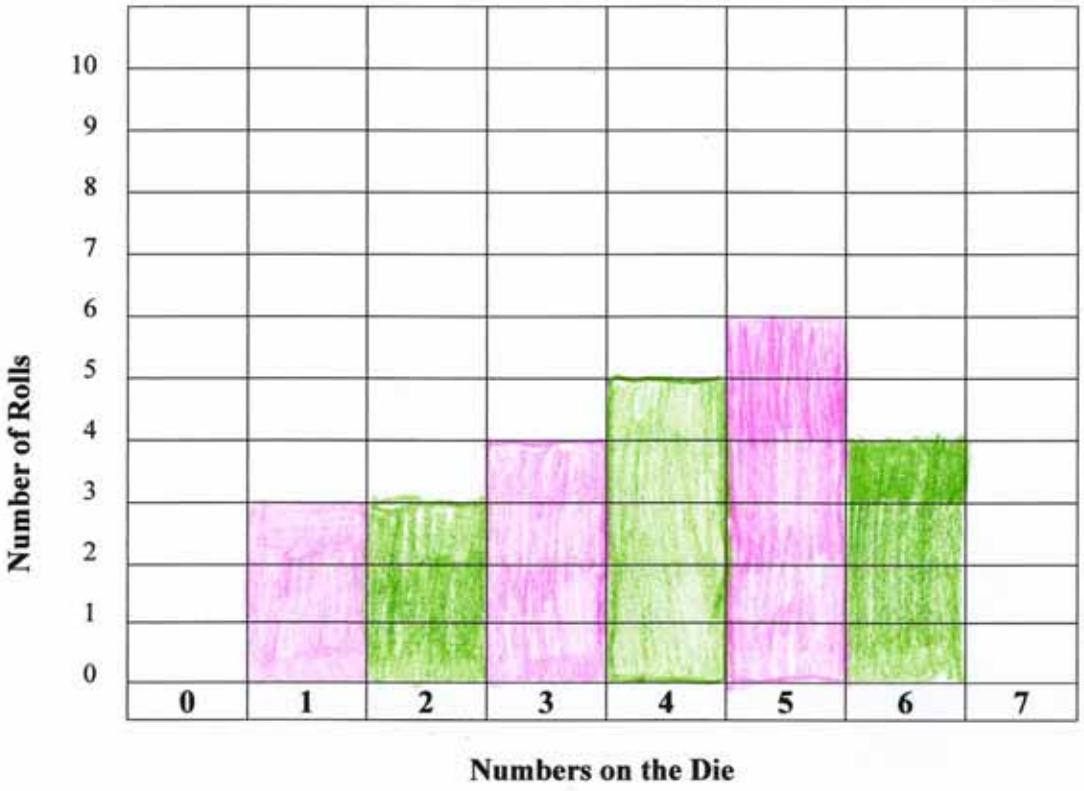
- Roll the die 25 times. Record each roll.
- Make a graph of the results. Put an X in the squares.
- Please answer the following questions after you complete your 25 rolls:

1. Which number turned up most often? 5
2. Were the others close? 2, 4, 6 were close
3. Did you ever roll a zero or a seven? NO!
4. What is the probability of rolling a zero or a seven? 0% impossible
5. What is the probability of rolling a one, two, three, four, five, or a six each roll? Certain
6. What do you think would happen after a great many rolls? you would end up with all x's on your paper.
7. Name some events that are certain to happen. _____
8. Name some events that are impossible. to fly

Sample #3 – Page 2

Roll die 25 times and record results.

Probability Graph For Rolling Die



Write 3 statements about the graph.

1. first 4 was in the lead, then 5 took over.
2. 1 and 2 are tied and 3 and 6 are tied too.
3. 1 was the least from 5

Write 3 questions about the graph.

1. Which number got 2nd place?
2. Which got 1st place?
3. how many are on 5?

Looking at Student Work – Instructor notes and rating for work sample #3

Chamberlain Elementary Schools
Math Rubric

Name: _____ Teacher: Mrs. Ford

Date Submitted: 1-25-05 Title of Work: Certain or Impossible

	Criteria				Points
	4	3	2	1	
Explanation	A complete response with a detailed explanation.	Good solid response with clear explanation.	Explanation is unclear.	Misses key points.	3
Use Of Visuals	Clear graph with some explanation	Clear graph	Inappropriate or unclear graph.	No graph	4
Mechanics	No math errors.	No major math errors or serious flaws in reasoning.	May be some serious math errors or flaws in reasoning.	Major math errors or serious flaws in reasoning.	3
Demonstrated Knowledge	Shows complete understanding of the questions, mathematical ideas, and processes.	Shows substantial understanding of the problem, ideas, and processes.	Response shows some understanding of the problem.	Response shows a complete lack of understanding for the problem.	3
Requirements	Goes beyond the requirements of the problem.	Meets the requirements of the problem.	Hardly meets the requirements of the problem.	Does not meet the requirements of the problem.	3
				Total--->	16

Teacher Comments: Basic - This work was given a basic score because the student completed the graph. When I visited with this student one-on-one they were unable to name an event that was certain and struggled to tell me an event that was impossible.

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INSTRUCTIONAL NOTES

Author Comments

I did not use the dice squares when I did the lesson. The students colored in the boxes as they rolled the die. The students worked with partners to complete the graph. The lesson went smoothly, and the students were able to successfully complete the activity with their partner.

Resources

SD Mathematics Content Standards
http://www.doe.sd.gov/contentstandards/math/index.asp

SD Assessment and Testing
http://www.doe.sd.gov/octa/assessment/index.asp

The National Assessment of Educational Progress (NAEP)
http://www.doe.sd.gov/octa/assessment/naep/index.asp

National Council of Teachers of Mathematics
http://nctm.org/

Looking at Student Work
http://www.lasw.org/index.html